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ABSTRACT

Older adults are significantly slower than young adults in the naming response in the Stroop Color Word Interference Test. Hypotheses attempting to explain this age-related difference in a perceptual-cognitive task have included orthogenic principle, response-competition, and cautiousness. This study examines whether there are any significant performance differences on the Stroop test by cautious or "risky" older adults. Participants (N=41) were older adults ranging in age from 55 to 81. All participants were administered the Stroop Test and the Hand Test. In the Stroop Test subjects responded to stimuli by naming a color or color word as fast as possible. Participants were categorized as cautious or risky on the basis of the Hand Test. Analysis did not show slower response time for cautious adults. Data suggested that cautiousness increased with age and was manifested more in terms of fewer errors of commission per unit of time than in speed of response. These findings suggest that risky adults may encode stimulus information repeatedly before retrieving a response and that cautious adults might be slower in encoding information but have a higher probability of retrieving a correct response. (ABL)

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Cautiousness and Visual Selective Attention Performance of Older Adults

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Abstract

Cautiousness on the part of older adults has been implicated in the literature as an account for performance decrements on many tasks. This study sought to assess whether there were differences in performance on a visual selective attention task between "cautious" and "risky" older adults. On the basis of a projective personality test forty-one older adults (18 males, 23 females) ranging in age from 55 to 81 years (M age = 65.37) were classified as either cautious (N = 20, M age = 68.15 yrs., SD = 6.78) or risky (N = 21, M age = 62.71 yrs., SD = 5.46) were administered the Stroop-Color-Word Interference Test (Stroop, 1975); a measure of perceptual-cognitive processes.

Results indicated cautiousness tends to increase with age, and that irrespective of age, cautiousness is manifested more in terms of care/caution of response (i.e., fewer errors of commission per unit of time) than in terms of speed of response per se. Implications of results were discussed.

Cautiousness and Visual Selective Attention Performance of Older Adults

Perceptual-cognitive tasks, such as the Stroop Color Word Interference Test (Stroop, 1935) have been the focus of considerable interest in both the experimental psychology (e.g., Dyer, 1973; Jensen & Rohwer, 1966) and the adulthood of aging literature (e.g., Comalli, Wapner & Werner, 1962; Panek, Rush & Slade, 1984). The Stroop task requires the individual to name the color of the ink in which the word is printed. When the word is a conflicting color name, the color naming response tends to be significantly inhibited, compared to the response when the word and color correspond. The mixed-stimulus situation is thought to evoke two mutually exclusive responses which are said to "interfere" (Dyer, 1973; Posner, 1978), resulting in delayed response times.

The literature has consistently demonstrated individual differences as well as age in the Stroop interference effect, but has indicated only marginal age differences in the response time for the color naming response and for the word reading response. As noted, however, older adults are significantly slower than young adults in the color naming response when the color is inconsistent with the color word stimulus.

Numerous tentative hypotheses have been offered to explain the age-Stroop interference effect, e.g., orthogenetic principle; response-competition (with and without concomitant failure of selective attention); etc. (see Comalli, et al., 1962; Kausler, 1970, Panek, et al., 1984 for elaboration). One potential hypothesis that has been generally overlooked is a "cautiousness" hypothesis. Schaie and Gribben (1975) and others suggest the avoidance of risk or greater cautiousness on the part of older adults may play a significant role in the observed age decrements on a

number of laboratory and "real-world" tasks. Various experimental studies of older adults' performance indicate a tendency toward more errors of omission rather than errors of commission (Okun, 1976; Okun, Siegler, & George, 1978). It may be that the increase in response time of older adults on the Stroop test compared to young adults, simply reflect a difference in cautiousness in an attempt to avoid committing errors.

Many measures of cautiousness may be inappropriate since they all attempt to measure a personality-behavioral characteristic, indirectly, based on task performance (see Okun, 1976; Okun, et al., 1978; Panek & McGown, 1981). A more appropriate measure of a personality-behavioral characteristic, such as cautiousness, would be a direct assessment via some personality assessment instrument, such as projective techniques. Though many projective techniques used with older adults have been criticized (see Kahana, 1978), one projective technique, the Hand Test (Wagner, 1962), has satisfactorily addressed many of these criticisms for use with older adults (see Panek, Wagner & Kennedy-Zwergel, 1983 for review). Interestingly, one scoring category on the Hand Test, the High Minus Low Score (H-L) can be interpreted as a measure of cautiousness on the part of the individual (Wagner, 1962, pp. 24-25).

The purpose of the present investigation was to examine whether there are any significant performance differences between "cautious" and "risky" older adults on the Stroop test. Based on existing literature, two tentative hypotheses were suggested: 1) "cautious" older adults would have significantly longer response times on the Stroop task, especially on the "interference" card (Card C) compared to "risky" older adults;

2) "cautious" older adults would make significantly less errors on the Stroop task, compared to "risky" older adults.

Participants were forty-one (41) community-living older adults (18 males, 23 females) ranging in age from 55 to 81 years (M age = 65.37, SD = 6.66), recruited at a rural midwestern community senior center, and paid $3.25 for participation. All participants were in good or excellent (self-report) with an average Quick Test IQ (Ammons & Ammons, 1962, a,b, of 134.27 (SD = 21.66). The average number of years of formal education attained by the sample was 12.53 years (SD = 3.47).

All participants were administered the Stroop Test (Stroop, 1935) and the Hand Test (Wagner, 1962) according to standard procedures for each instrument. Briefly, the Stroop Test requires subjects to respond to stimuli printed on three different cards (23.5 X 23.5 cm). The stimulus material (color names printed in black ink, color patches, or color names printed in a conflicting ink color) is arranged on each card as 10 lines of 10 items with an additional practice line at the top of the card. The subject's task is to name the color word (card A) or name the color of the patch or word (cards B and C) as fast as possible. Card C represents the mixed-cue stimulus (see Dyer, 1973 for detailed descriptions). Total time, in seconds, for responding to the 100 items on each Stroop card (A - word reading; B - color naming; C - color naming with word interference) and total number of errors committed on each card were the primary measures of interest.

Participants were categorized as either "cautious" (H-L score $>$ 6.5 sec.) or "risky" (H-L score $<$ 6.5 sec.) on the basis of a median split

for the overall samples distribution of H-L scores (range 2.0 to 29.0 sec.) derived from the Hand Test (Wagner, 1962). Stroop response time and number of errors by group (cautious vs. risky), as well as age, level of education, and IQ, are presented in Table 1. Significant difference

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Insert Table 1 About Here

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between the groups in terms of age ($t = 2.84$, $p < .01$), necessitated additional analyses, statistically adjusting for an age.

Analyses reported in Table 1 failed to support the hypothesis of slower response time for "cautious" adults. As indicated in the table, the one significant difference (Card C) was eliminated when the effect of age was statistically controlled.

Analyses did support the hypothesis predicting significantly fewer errors by the cautious group on all Stroop cards, even after statistically controlling for age.

These data suggest that cautiousness tends to increase with age, and that irrespective of age, cautiousness is manifested more in terms of care/caution of response (i.e., fewer errors of commission per unit of time) than in terms of speed of response per se.

Analyses reported in Table 2 were designed to explore within-person differences in performance on the Stroop Test. A mixed model analysis indicated an overall significant difference in response time for word reading and color naming, as well as for cards B and C (word interference effect). These within-person comparisons did not differ significantly

for cautious and risky individuals. Controlling for the effect of age, however, marginally suggested that the cautious group had a slightly higher Stroop interference effect. Similarly, all participants committed more errors on Card B relative to Card A (t = -4.90; $p < .000$), an effect that was marginally higher for the risky group (t = -1.62, $p < .057$), particularly when age was statistically controlled. The data also suggest that the risky group committed significantly more errors across all three cards than the cautious group (t = 2.72, p = .005; t age = 3.044, p = .002).

Insert Table 2 About Here

Again, analyses (Table 1, Table 2) suggest that a lack of caution on the part of older adults may be manifested more in terms of errors of commission, rather than in speed of response. Although the cautious group had a marginally higher Stroop interference effect after controlling for age, the difference in effect does not appear to be related to the relative number of errors committed on the respective cards. Similarly, the tendency for the risky group to commit significantly more errors in color naming relative to word naming (Card A vs. B) appears to be unrelated to speed of response.

From an information processing perspective, results suggest that risky older adults, due to a possible failure to closely attend, may process (encode) stimulus information repeatedly before retrieving a response. Repeated, albeit erroneous, encoding would likely result in a higher probability of retrieving an erroneous response. In contrast,

cautious older adults may be slower and more cautious in processing (encoding) stimulus information, but have a higher probability of retrieving a correct response.

Although this information - processing interpretation is speculative, it appears consistent with the work of Kausler (1970) and Burke and Light (1981) who emphasized the role of encoding and retrieval processes in explaining difficulties manifested by older adults on cognitive tasks such as the Stroop. The suggested interpretation also appears consistent with Wagner's (1962) interpretation of the H-L scoring category from the Hand Test as an indication of intellectual, i.e., cognitive, delay.

Results of the present investigation indicate cautiousness increases with increasing age, and that level of caution or risk can significantly affect performance on the Stroop Test, and perhaps other cognitive tasks. Obviously, the results of the present study should be interpreted cautiously because of its sampling features, but, these limitations should not obviate theoretical significance. Finally, further research on the Stroop Test are warranted across the life-span.

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Table 1

Mean Scores for Cautious and Risky Groups

	Cautiousness (C)								
			Risky (n = 21)		Cautious (n = 20)				
Response time:	M	SD	M	SD	M	SD	tc	B Age	tc Age
Card A	45.76	11.59	44.71	6.63	46.85	15.30	-.59	.139	-.38
Card B	67.46	20.93	61.91	13.09	73.30	25.92	-3.20*	.663	-1.25
Card C	136.24	39.39	131.62	36.99	141.10	42.16	-.59	2.280*	-.25
Response errors:									
Card A	.42	.77	.71	.96	.10	.31	7.51**	-.010	2.51**
Card B	1.85	1.94	2.57	1.96	1.10	1.65	6.71**	-.032	2.89**
Card C	3.05	3.81	4.19	4.45	1.85	2.60	4.18*	-.071	2.39**
Age	65.37	6.65	62.71	5.46	68.15	6.78	2.84**		
E. Level	12.93	3.47	12.76	4.04	13.10	2.86	.64		
IQ	134.27	21.66	131.43	20.81	137.25	22.67	.85		

Note: B age is the unstandardized regression for age; tc-age is the t-value of a test between means, controlling for age.

*p < .05 (1-tail)
**p < .01 (1-tail)

Table 2

Summary: Mixed Model Analysis of Variance and Covariance (Age) for Stroop response time and errors by level of cautiousness

	df	Response time t	(p)	(*age) t	(p)	Response errors t	(p)	(*age) t	(p)
Between Subject									
Caution (C)	1	-1.65	(.25)	-.33	(.37)	2.72	(.01)	3.04	(.00)
Within Subject									
Cards (B-A)	1	-17.28	(.00)	10.25	(.00)	-4.90	(.00)	4.97	(.00)
Cards (C-B)	1	-8.18	(.00)	4.44	(.00)	-.41	(.34)	.41	(.34)
C* (B-A)	1	.70	(.24)	-.44	(.33)	-1.62	(.06)	-2.05	(.02)
C* (C-B)	1	-.97	(.17)	-1.52	(.07)*	-.01	(.50)	-.01	(.50)